Fracture Management by Family Physicians and Guidelines for Referral

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Family physicians are now receiving more formal training in orthopedics, preparing them to deal with common orthopedic problems. Core curriculum objectives for orthopedics are being developed in family practice programs. Family physicians should have guidelines as to which fractures and dislocations they themselves can manage and which fractures should be managed by orthopedists. General guidelines for consultation and referral are presented, and the management of specific common fractures in adults and children is outlined. Many fractures can be cared for by the family physician with appropriate consultation and advice from the orthopedist.

Family practice residents are currently receiving training in many aspects of orthopedics with most family practice residency programs offering electives or required rotations on orthopedic services. Also, core curriculum objectives for orthopedics in family practice are now being developed. Of course, curriculum objectives in family practice will include not only management of fractures, but also management of dislocations and soft tissue injury, such as muscle sprains and ligament strains. Often the soft tissue injury is neglected and such neglect can cause future problems. Anyone attempting to deal with traumatic problems should also have a basic knowledge of the extent of these injuries. And family physicians are often asked to act as "team physicians," requiring them to have some knowledge of traumatic problems.

This paper will address only the management of fractures. As a result of residency training, family physicians are becoming better trained to deal with the many patients with fractures who present first to their primary physician. Some questions that arise, however, are which fractures can probably be managed by family physicians, which patients should definitely be referred to an orthopedist, and which fractures can possibly be managed by a family physician, depending on his/her training and experience.

Though several exhaustive texts[1-5] detail fracture management, none of them attempt to answer questions about which fractures should be managed by family physicians and which should be referred to orthopedists. In this paper this question will be approached by listing, in tabular form, some common fractures and by denoting whether the patient should be referred, how the fracture might be managed, what complications might be expected, and pertinent comments about the fractures. Certainly a subject as complicated as frac-

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ture management cannot simply be listed in "cookbook" fashion, and this paper makes no attempt to lend that impression. On the contrary, the suggestions for management presented here should be used as guidelines and as a quick reference source for family physicians, and orthopedic consultation should be requested whenever there is a question about management.

The way in which a family physician manages fractures will certainly vary with his/her training, experience, and the availability of orthopedic consultants. Also, somewhat unfortunately, decisions on whether or not to manage a fracture may be influenced by the malpractice insurance premiums in the state. For instance, in some states malpractice premiums are higher for a physician who actually reduces fractures than for one who simply applies casts to fractures which do not require reduction. Another area of consideration is the physical facilities which are necessary for fracture care. This involves the cost of buying a cast saw, obtaining casting material, keeping an adequate supply of plaster in the office, having suitable splints for post-cast care, and having facilities to obtain x-rays during the course of treatment. As for anesthesia, all fractures listed below as amenable to management by family physicians can be reduced under local anesthesia.

Of course, the aim of the guidelines presented is provision of good medical care to patients and rehabilitation to the best of their ability in the shortest possible time. This, of course, may often require referral, but many traumatic injuries can be cared for by the primary physician with appropriate consultation and advice from the orthopedic specialist. It behooves the family physician to have a good working relationship with an orthopedist who will be willing to reaffirm and otherwise advise the family physician informally on questions of management in specific cases.

Because the management of fractures differs so greatly in children and adults, they will be considered separately.

Fractures in Adults

General Considerations

Before proceeding with general guidelines for fractures in adults, a few terms often used in dealing with fractures will be defined.

Nonunion—failure of a fracture to unite
Mal-union—union of a fracture unsatisfactorily, with a deformity in angulation, rotation, or length
Delayed union—union of a fracture over a longer length of time than would be expected
Open fracture—a fracture in which the skin is broken, and which by definition is contaminated and more likely to become infected
Comminuted fracture—one in which the bone is broken into more than two pieces
Closed fracture—the skin over the fracture is not broken
Fracture-dislocation—fracture of a bone near a joint, also involving dislocation of that joint

Because of their high incidence of complications (Table 1), the following fractures should probably always be referred to an orthopedist:
Fractures involving joint surfaces
Fracture-dislocations
Open fractures
Severely displaced comminuted fractures
Cervical spine fractures
Both bone fractures of the lower leg or forearm
Fractures involving the elbow, (olecranon, intercondylar, supracondylar)
Any fracture involving the femur
Patients with multiple fractures, or fractures requiring inpatient management

Fractures which can be managed by the family physician include simple, stable, nondisplaced closed fractures of the following bones:
Phalanges
Metacarpals
Metatarsals
Malleoli
Tibia
Fibula
Patella
Pelvis
Forearm (single bone mid-shaft)
Humerus (mid-shaft)
Vertebrae (lumbar or thoracic, compression type)
Clavicle
Ribs

Fractures which are somewhat more complicated and might require orthopedic consultation, but which might be managed by the family physician depending on his training and experience include:
Closed fractures of the carpal and tarsal bones
Colles fractures

Table 1. Specific Fractures in Adults*

Fracture	Management	Complications	Comment
Cervical spine	REFER. Stable: Collar for 2 months. Unstable or fracture-dislocation: skull traction, ORIF.	Spinal cord injury	Always obtain cervical spine series with neck immobilized on any trauma victim complaining of neck pain.
Clavicular	Figure eight bandage or sling for 3 weeks. Fractures at extreme lateral or medial end: REFER	Mal-union, delayed union, nonunion	Almost never requires open reduction. Malunion occurs, is a cosmetic problem, and can rarely produce brachial plexus compression.
Rib	Sufficient pain medication	Puncture of underlying viscus, atelectasis leading to pneumonia	Observe for liver laceration with lower right rib fracture, pneumothorax with upper rib fractures, spleen laceration with left lower rib fractures.
Impacted humeral neck or greater tuberosity	Sling for 2 to 6 weeks, pendulum exercises begun in 2 to 6 weeks.	"Frozen" shoulder,[6–8] injury to axillary artery	Nonimpacted fracture more difficult to treat, may require abduction shoulder spica. Use axillary x-ray view to rule out dislocation.
Shaft of humerus	Sugar tong splint	Delayed union (too much traction from hanging arm cast), radial nerve injury, nonunion	Shoulder and elbow stiffness common.
Supracondylar humeral	REFER, may need ORIF	Mal-union, Volkmann ischemia	Splint in extension until orthopedist can reduce; observe for radial pulse, capillary filling, and pain on passive extension of thumb.
Intercondylar humeral	REFER, may need ORIF	Joint stiffness	
Fracture-dislocation of elbow	REFER, may need ORIF	Joint stiffness, degenerative joint disease	
Olecranon	REFER, may need ORIF	Nonunion, degenerative joint disease	
Both bone forearm or single distal or displaced proximal forearm bone	REFER for ORIF	Mal-union, delayed union, nonunion	Perfect reduction (usually that obtained by ORIF) ensures good pronation, supination, and joint function. Usually with a single forearm bone fracture, there is some degree of dislocation at elbow or wrist.
Depressed or comminuted radial head	REFER for excision of radial head	Degenerative joint disease	

*ORIF—Open Reduction, Internal Fixation
SAC—Short Arm Cast
LAC—Long Arm Cast
DJD—Degenerative Joint Disease
HMSLC—Highly Molded Short-Leg Cast
HMSLWC—Highly Molded Short-Leg Walking Cast

Table 1, continued

Fracture	Management	Complications	Comment
Nondisplaced radial head	Sling or splint, motion imperative	Loss of range of motion	Immobilization for more than 2 weeks not advisable. Actual damage to joint surface may be more than is apparent on x-rays.
Colles fracture (fracture of distal radius with distal fragment displaced posteriorly)	Undisplaced: SAC for 6 weeks; Displaced: reduction and appropriate immobilization	Mal-union, finger stiffness, reflex sympathetic dystrophy	Maintaining reduction is a major problem, must x-ray weekly for first 3 weeks.
Smith fracture (distal fragment displaced anteriorly) of radius	REFER		"Reverse Colles," fall on dorsum of wrist is usual mechanism.
Carpal scaphoid (navicular)	Thumb spica on SAC until union, changing cast frequently to ensure fit	Avascular necrosis, delayed union, nonunion, degenerative joint disease, look for other injuries such as carpal and wrist dislocation	Fracture often subtle on x-ray, tenderness over "anatomical snuff box," x-ray all "sprains" at 10-14 days. Union may require several months.
Bennett fracture (fracture through thumb metacarpal into carpometacarpal joint, with subluxation)	REFER: if unstable, may need ORIF	Degenerative joint disease	Difficult to obtain good closed reduction.
Fifth metacarpal	SAC for 2 weeks, finger in flexion	Flexion contraction of finger if immobilized too long	Unstable fractures may need Kirschner wire placed.
Other metacarpals	Nondisplaced fractures require only protection (sling) for 3 weeks; displaced fractures require SAC for 3 weeks	Rotatory deformities often not recognized, require referral if present	Intraarticular, displaced fractures need Kirschner wire fixation.
Displaced phalangeal	Aluminum splint for 2 to 3 weeks	Rotatory deformity	Displaced intraarticular fractures need Kirschner wire fixation by orthopedic surgeon.
Nondisplaced phalangeal	Tape to adjacent finger for 2 weeks		
Mallet finger (avulsion fracture, distal phalanx)	Extension splint for 6 weeks	Drop finger	X-ray often read as negative.
Thoracic and lumbar spine: wedge compression	Bed rest acutely, analgesia, corset for 4 weeks if necessary	Residual pain	Stable fracture.
Thoracic and lumbar spine: fracture-dislocation	REFER	Traumatic paraplegia	

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Table 1, continued

Fracture	Management	Complications	Comment
Thoracic and lumbar spine bursting compression	REFER	Spinal cord injury not uncommon	Neurologic complications are rare; x-ray os calcis also because of high incidence of associated fractures.
Pelvis, stable (pelvic ring not disrupted)	Bed rest, analgesia, nonweight bearing on affected side	Most important complication is injury to soft tissue (ie, blood vessels, bladder, urethra, or sacral nerves)[9,10]	Observe for shock, hematuria.
Pelvis, unstable (pelvic ring disrupted, fracture in 2 sites)	REFER	Most important complication is injury to soft tissue (ie, blood vessels, bladder, urethra, or sacral nerves)[9,10]	Observe for shock, hematuria.
Neck of femur	REFER for ORIF (nailing or prosthesis)	Highest incidence of complications of any fracture in body: 50 percent will have DJD, avascular necrosis, or nonunion	Almost all are displaced, a very difficult orthopedic problem.
Trochanteric femur (intracapsular)	REFER for ORIF	Mal-union leading to coxa vara not uncommon	Union requires 12 to 16 weeks without ORIF; nonunion and avascular necrosis rare. Nonoperative management may be better if patient is medically unstable.
Shaft of femur	REFER for cast brace, ORIF, or intramedullary nail	Delayed union, arterial injury[11]	Watch for fat embolism, massive hemorrhage, and for neurovascular problems.
Intercondylar distal femur	REFER for ORIF	Degenerative joint disease, knee stiffness	Uncommon fracture.
Patella, displaced or comminuted crush fracture	Cylinder walking cast for 3 weeks; may need referral for ORIF or excision of loose pieces	Uncommon	
Fibula	Requires no immobilization or restriction of weight bearing	None	Rarely occurs alone, watch for associated tibial fracture or tibiofibular joint dislocation.
Tibial plateau fracture	REFER, may need ORIF	Lateral peroneal nerve injury, knee stiffness	
Tibia, stable, transverse and oblique fracture	REFER	Usually can be treated closed	Shortening of affected leg by 2 cm acceptable.

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Table 1, continued

Fracture	Management	Complications	Comment
Tibia, unstable transverse and oblique fracture	REFER	Often treated closed, open reduction leads to high incidence of infection; nonunion, artery and nerve injury common	
Bimalleolar ankle	REFER		
Medial malleolar ankle	HMSLC for 4 weeks, then HMSLWC for 4 weeks	Closed reduction often unstable, nonunion common, may require ORIF	
Lateral malleolar ankle	HMSLC for 3 weeks, then HMSLWC for 3 weeks	Closed reduction usually stable	Most common ankle fracture, repeat x-ray frequently to detect ligamentous stability and talar tilt.
Talus (neck)	REFER	Nonunion in 50 percent, high incidence of DJD, fusion often necessary	
Os calcis (calcaneum)	REFER	High incidence of residual pain	Intraarticular fractures can be very complicated, x-ray thoracic and lumbar spine also due to high incidence of associated fractures.
Other tarsals	HMSLWC for 4 weeks		
Metatarsals	HMSLC for 4 weeks, then HMSLWC for 4 weeks	With multiple fractures: hemorrhage and circulation to forefoot often decreased	Occasional Kirschner wire fixation necessary for multiple fractures.
Phalanges	Tape to adjacent toe for 2 to 3 weeks		

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Medial and lateral epidondyle fractures of the humerus, nondisplaced
Fracture of neck of the humerus

Specific Fractures

Table 1 lists common fractures in adults and suggests whether the patient should generally be referred, how the fracture might be managed, and what complications might be expected.

Fractures in Children

Any orthopedist will fervently agree with the maxim advanced for years by pediatricians—children are not just small adults. Fractures occur more frequently in children than in adults and some fractures require proportionately more force to cause them because children's bones are more flexible and less osteoporotic. Also, in children, fractures heal more rapidly, certain deformities correct spontaneously, and closed reduction is made easier due to their strong, flexible periosteum.[12] Unfortunately, however, fractures in children are fraught with complications such as osteomyelitis, Volkmann ischemia, and hypotension secondary to major blood loss.

Table 2. Salter-Harris Classification of Epiphyseal Fractures

Type	Description	Type Treatment	Prognosis for Normal Growth	Comment
I	Complete separation of epiphysis without any fracture through bone	Closed	Good	More common in infants and young children.
II	Fracture separation along epiphyseal line then out through metaphysis	Closed	Good	Most common epiphyseal fracture in older children, prognosis poor at distal femoral epiphysis.
III	Fracture of part of epiphysis	Closed or Open	Guarded	Most common at distal tibia.
IV	Fracture from joint surface through epiphysis, epiphyseal plate, and metaphysis	Open	Guarded	Intraarticular; most common at lateral humeral condyle.
V	Crush injury of epiphyseal plate	Closed	Poor	Knee, ankle most common sites.

Moreover, epiphyseal plates around which growth is taking place are very commonly involved in fractures in children, and only careful, expert care can assure the best outcome in growth and alignment of significant epiphyseal fractures. Table 2 reviews the Salter-Harris Classification of epiphyseal fractures and the management and prognosis for each type of fracture.[13]

Also, any physician should certainly be aware of the incidence of child abuse, and should keep this in mind when examining any child with a fracture. The following fractures in children should be referred to an orthopedist:

Fractures involving joint surfaces
Any open fracture
Cervical fractures
Any fracture involving the elbow or knee (these fractures almost always involve the epiphyseal plates)
Both bone fractures of the forearm or lower leg
Severely comminuted fractures
Fractures involving the epiphyseal plates (except for some nondisplaced Type I or Type II fractures)
Any significantly displaced or unstable fracture of the metacarpals or metatarsals

Fractures which can usually be managed by the family physician:

Torus fractures (buckle fracture)
Greenstick fractures
Simple nondisplaced closed fractures of the phalanges
Metacarpal fractures (nondisplaced)
Metatarsal fractures (nondisplaced)
Malleolar fractures
Tibial fractures
Fibular fractures
Patellar fractures
Forearm (single bone, mid-shaft)
Humerus fractures (mid-shaft)
Pelvic fractures (nondisplaced)
Clavicle fractures
Rib fractures

Fractures which might be managed by the family physician, depending on his training and experience:

Metacarpal fractures (displaced)
Metatarsal fractures (displaced)
Malleolar fractures (displaced)
Tibial fractures (displaced)
Fibular fractures (displaced)
Patellar fractures (displaced)
Humerus fractures (proximal or distal metaphysis)
Types I and II epiphyseal fractures

Table 3 outlines the treatment for and complications of specific fractures in children. It is hoped that this outline can be used as a guideline by family physicians for the management of fractures in children.

Table 3. Fractures in Children: Specific Fractures*

Fracture	Treatment	Complications	Comment
Clavicle	Figure eight bandage for 2 to 4 weeks; closed reduction may be indicated	Very rare	"Greenstick" clavicular fractures need only a sling for 3 weeks, open reduction almost never indicated.
Proximal humeral epiphysis	Sling and swathe bandage for 3 weeks if nondisplaced; if displaced, may require referral for closed reduction	Growth disturbance	
Shaft of humerus	Undisplaced: sugar tong splint and body bandage for 3 weeks; Displaced: closed reduction	Radial nerve injury	
Supracondylar humerus	For closed reduction in cast for 3 weeks, REFER	Volkmann ischemia, nerve injury, mal-union	Comparison views of other arm necessary. Early and prompt referral. An example of a true orthopedic emergency.
Lateral epicondyle of humerus	Unless nondisplaced, requires referral for ORIF	Cubitus varus, nonunion	One of few examples where nonunion can occur in children, often missed on x-ray.
Avulsion of medial epiphysis of humeral epicondyle	If grossly unstable, refer for ORIF. If stable, LAC for 3 weeks	Traction injury of ulnar nerve	
Proximal radial epiphysis	REFER	Avascular necrosis of epiphyseal plate	
Monteggia fracture-dislocation (fracture of shaft of ulna and dislocation of radiohumeral joint)	REFER for LAC for 6 weeks	Tardy palsy of radial nerve[14,15]	Danger in not recognizing the dislocation component of the injury.
Transient subluxation of radial head	After reduction of subluxation, sling for few days until pain is relieved		Common minor injury sustained by strong pull on extended elbow (nursemaid elbow), may recur, often incidentally reduced by x-ray technician.
Distal radial epiphysis	Appropriate immobilization, SAC or LAC		
Both bones forearm	REFER for reduction, above elbow cast for 6 weeks (if Greenstick, fracture must be completed)	Restricted pronation, supination	Common in children.
"Buckle" fracture of radius (torus fracture)	Protection (cast) for at least 3 weeks		Repeat x-ray frequently.

*LAC—Long Arm Cast
SAC—Short Arm Cast
ORIF—Open Reduction, Internal Fixation
SLWC—Short Leg Walking Cast

Table 3, continued

Fracture	Treatment	Complications	Comment
Carpal scaphoid (navicular)	Prolonged immobilization in SAC (2 to 3 months) with thumb spica	Avascular necrosis, delayed union, nonunion, degenerative joint disease	Uncommon in children, look for associated carpal lesions.
Neck of fifth metacarpal	SAC for 2 to 3 weeks, with finger in moderate flexion, then early motion to prevent stiffness		"Boxer fracture."
Phalangeal and metacarpal fractures of shaft	Splint to finger with tape for 3 weeks (phalanx), SAC for 3 to 4 weeks (metacarpal)	None significant, if reduction is maintained	Types I and II epiphyseal fractures should be managed by family physicians if adequately reduced. Types III, IV, V should be referred; displaced intraarticular fractures should be referred.
Salter-Harris Type II fracture of little finger	May need reduction		"Octave" fracture.
Thoracic spine	Immobilization for 8 weeks in brace or body cast	Rare	Unusual fracture in child, rule out pathologic cause.
Lumbar spine	Body cast for 8 weeks	Fracture-dislocation with injury to cauda equina common	Requires violent trauma to produce fracture.
Pelvis, stable	Non-weight bearing until fracture heals	Soft tissue injuries to vasculature, genitourinary system	Uncommon.
Pelvis, unstable	REFER	Soft tissue injuries to vasculature, genitourinary system	Uncommon.
Femoral head, epiphyseal	REFER for ORIF	Avascular necrosis to femoral head	Extremely high incidence of complications.
Femoral neck	REFER for ORIF followed by hip spica or cast brace for 3 months	Avascular necrosis of femoral head in 30 percent	
Femoral shaft	REFER for traction, hip spica, cast brace	Volkmann ischemia	Overriding of 1 cm acceptable; essentially no indication for ORIF.
Patella, displaced or comminuted crush fracture	REFER for ORIF	Extensor lag, chondromalacia, degenerative joint disease	Hemarthrosis common.
Patella, nondisplaced linear or crush	Cylinder walker for 3 to 6 weeks	Unusual	
Distal femur or proximal tibia	REFER	Incidence of growth abnormalities significant, popliteal artery injury may accompany	Almost always involves epiphyseal injury of distal femoral or proximal tibial epiphysis.

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Table 3, continued

Fracture	Treatment	Complications	Comment
Tibial shaft	Cast immobilization until healed, 4 to 10 weeks	Uncommon	Almost never requires ORIF.
Ankle, Salter-Harris Type I (fracture of distal fibular epiphysis)	SLWC for 3 weeks		Often confused with sprain, missed on x-rays.
Ankle, Salter-Harris Types II-V (fracture of distal fibular epiphysis)	REFER	Growth abnormalities common, may require open reduction	
Os calcis	Appropriate cast immobilization		Unusual in children, x-ray spine also (high incidence of vertebral fractures).
Base of 5th metatarsal (Dancer fracture)	Symptomatic immobilization with cast or firm shoe		Dancer fracture or Jones fracture.
Metatarsals	Symptomatic immobilization with cast or firm shoe	Vascular injury common	Usually secondary to crushing injury.
Carpals, nondisplaced	Symptomatic immobilization with cast or firm shoe	Uncommon	
Carpals, displaced	REFER	Uncommon	
Phalanges, stable	Tape toes together	Uncommon	
Phalanges, unstable or intraarticular	REFER	Uncommon	

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